Design and Synthesis of Some Chemo-sensors for Detection and Quantification of Different Nerve Agents in Living Cell System

Nerve agents (NAs) are highly toxic volatile liquids, gases or aerosols that irreversibly block the enzyme acetylcolinesterase in neuronal synapses, thus disrupting nerve impulse transmission which causes severe effects on human and animal health leading to death through the paralysis of respiratory muscles. These compounds are a family of highly toxic phosphoric acid esters, structurally related to a larger family of organophosphate (OP) compounds. Nerve gas agents can be classified according to the following criteria: (1) boiling point: nerve agents can be classified into two categories namely volatile and non-volatile. (2) Country of origin: agents originally developed in Germany were designated as ‘‘G series’’ agents; these include Sarin (GB), Tabun (GA) and Soman (GD). (3) Toxicity: ‘‘V series’’ agents, V stands for venomous and includes VE, VG, and VX.

Organo phosphorus compounds (OPs) are also key components in agricultural pesticides and herbicides, which play vital roles in modern agriculture. However, the extensive overuse of these compounds has led to the poisoning of thousands of humans throughout the world. These OP compounds are structurally similar to nerve gases and are also acetylcholinesterase inhibitors.

As a consequence, there is a need to develop sensitive and selective receptors for the detection of said compounds. The techniques used to detect organophosphorus compounds (OPs) and chemical warfare agents (CWAs) include, electrical sensors, surface acoustic waves, calorimetric methods, electrochemistry, lanthanide luminescence, photonic crystals and fluorescence indicators. Chromo-fluorogenic sensors are attractive as a result of their excellent operational simplicity, portability, cost effectiveness and power of real time detection and the ability to integrate functionality that reacts with CWAs. There are many different analytical techniques developed based on changes in the fluorescence properties of a molecule in different environments. The recently developed methods are PET based probes, cyclisation reactions in push–pull chromophores, displacement like assays, molecular impregnated polymers, oximate containing sensors, nucleophilic substitution reactions and complex formation based probes. Despite these elegant studies, there is still significant room for improvement. In addition to quick response and high sensitivity, a truly practically useful fluorescent probe should display a ratiometric and colorimetric response. Such features can reduce the background interference and false positive results. Moreover, a probe that enables us to analyze samples using easy-to-use devices is highly desired for real time studies. Finally, such a

probe should be able to be employed for the analysis of both liquid and gaseous nerve agents.

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